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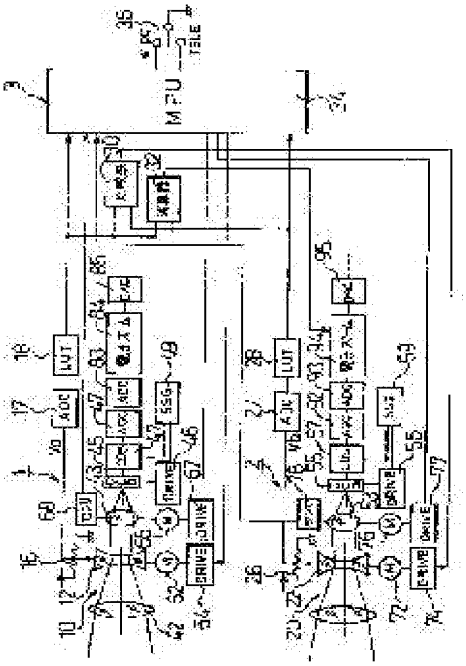
(54) **DRIVER FOR ZOOM LENS**



(57)Abstract:
PROBLEM TO BE SOLVED: To provide a driver for a 3D zoom lens in which left/right image pickup magnification is matched with high accuracy by controlling electronic zooming so that one image magnification is coincident with other image magnification based on zoom position data denoting image pickup magnification of left/right zoom lenses.
SOLUTION: Zoom positions of left/right magnification lenses 12, 22 are detected respectively by position detectors 16, 26 as zoom position voltages Va, Vb, the zoom position voltage is A/D-converted and LUTs 18, 28 are used to correct the zoom position data in order to make the detection characteristic of both the position detectors in matching with each other. The zoom position data are fed to a comparator 30 and a motor driver 74 for driving the magnification lens 22 is controlled based on the output of the comparator 30. Furthermore, the magnification of the electronic zoom of an electronic zoom circuit 94 is controlled based on the zoom position data to eliminate a slight error in the image pickup magnification during tracing drive of the magnification lens 22 on an image.

CLAIMS

[Claim(s)]
[Claim 1]A drive of a zoom lens which drives the 1st and 2nd zoom lenses arranged for photography of a stereoscopic picture at a right-and-left couple characterized by comprising the following.
A zoom switch which orders it zooming of the tele direction or the wide direction.
The 1st driving means that drives said 1st zoom lens in the tele direction or the wide direction by operation of said zoom switch.
The 1st and the 2nd detection means of detecting a zoom position which shows photographing magnification of said 1st and 2nd zoom lenses, respectively.
Based on zoom position data detected by the said 1st and 2nd detection means, The 2nd driving means that drives said 2nd zoom lens so that photographing magnification of said 2nd zoom lens may be in agreement with photographing magnification of said 1st zoom lens, The 1st and 2nd imaging means that picturize an object image which passed said 1st and 2nd zoom lenses, respectively, An electronic zoom means which expands and contracts one image magnification electrically based on zoom position data detected by the said 1st and 2nd detection means so that it might be in agreement with image magnification of another side among pictures of a couple picturized by said 1st and 2nd imaging means.

[Claim 2]A drive of a zoom lens which drives the 1st and 2nd zoom lenses arranged for photography of a stereoscopic picture at a right-and-left couple characterized by comprising the following.
A zoom switch which orders it zooming of the tele direction or the wide direction.
The 1st driving means that drives said 1st zoom lens in the tele direction or the wide direction by operation of said zoom switch.
The 1st and the 2nd detection means of detecting a zoom position which shows photographing magnification of said 1st and 2nd zoom lenses, respectively, and digitizing and outputting this detected zoom position data.
At least one look-up table amended so that at least one zoom position data of the said 1st and 2nd detection means may be inputted, an output value according to a digital value of a this inputted signal may be memorized beforehand and the zoom position detecting characteristic of the said 1st and 2nd detection means may be coincided.
The 2nd driving means that drives said 2nd zoom lens so that it may be detected by the said 1st and 2nd detection means, and may be amended by said look-up table and photographing magnification of said 2nd zoom lens may be in agreement with photographing magnification of said 1st zoom lens based on zoom position data.
The 1st and 2nd imaging means that picturize an object image which passed said 1st and 2nd zoom lenses, respectively.
An electronic zoom means which expands and contracts one image magnification electrically based on zoom position data detected by the said 1st and 2nd detection means so that it might be in agreement with image magnification of another side among pictures of a couple picturized by said 1st and 2nd imaging means.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the drive of the zoom lens of 2 eye type 3D camera used for photography of the stereoscopic picture reproducing the picture which starts the drive of a zoom lens, especially makes an observer realize a cubic effect.
[0002]
[Description of the Prior Art]Conventionally, a photographic subject is photoed with the camera of two right and left equivalent to both eyes, and the art of obtaining the stereoscopic picture which makes an observer realizing a cubic effect is proposed. The composition of the drive of the zoom lens of the conventional 2 eye type 3D camera is shown in drawing 9. The drive of the zoom lens shown in the figure carries out synchronous control of the video cameras 1 and 2 of two right and left with the micro processing device 3.
The 1st actuator 14 that mainly drives the variable power lens 12 of the left-hand side zoom lens 10, The 1st position transducer 16 that detects the zoom position (for example, value which shows the position of the variable power lens 12) of the zoom lens 10 of this left-hand side, The 2nd actuator 24 that drives the variable power lens 22 of the right-hand side zoom lens 20, It comprises zoom switch 36 grade for considering call / wide zooming command operation as the 2nd position transducer 26 that detects the zoom position of this right-hand side, and the microprocessing unit (MPU) 34 which carries out synchronous control of said 1st and 2nd actuators.
Exchange on either side is possible.
[0003]If the contact piece of the zoom switch 36 is contacted at the call side (or wide side), from MPU34, the control signal which operates the motor drive circuits 64 and 74 will be outputted simultaneously. And based on this control signal, each drives the motors 62 and 72, and the motor drive circuits 64 and 74 make an optical axis direction carry out back and forth movement of the variable power lenses 12 and 22. By said 1st and 2nd position transducers 16 and 26, the position of the variable power lenses 12 and 22 is detected, respectively, and is notified to MPU34.
[0004]On the other hand, about focus control, the motor drive circuits 67 and 77 are controlled based on the signal from the auto-focusing (AF) means which is not illustrated, the focus lenses 43 and 53 are moved forward and backward via the motors 66 and 76, respectively, and focus adjustment is performed. A position is adjusted [said focus lenses 43 and 53] automatically that a focus seems not to shift with movement of the variable power lenses 12 and 22, respectively. And the position of the focus lenses 43 and 53 is detected by the sensors 68 and 78, respectively, and it is notified to MPU34.
[0005]Image formation of the object light which passed the zoom lens 10 of said left-hand side is carried out to the acceptance surface of CCD45, and it is changed into R of quantity according to the intensity of light, G, and B signal charge. Publicly known signal processing is performed and the electric charge of R, G, and B is outputted as a picture signal, after it is read by the read pulse added from CCD drive circuit 46 and signal separation is carried out by the CDS (correlation double sampling) circuit 47. The timing signal from the reference signal generator (speed signal generator) 49 is added to said CCD drive circuit 46, CDS circuit 47, and the digital disposal circuit 48, respectively.
The synchronization of each circuit is taken.
The same may be said of the video camera of said right-hand side.
[0006]

[Problem(s) to be Solved by the Invention]However, in the drive of the above-mentioned conventional zoom lens, even if it prepares the zoom lens system of a right-and-left EQC, there is a problem that an error arises in zoom magnifying power on either side according to the individual difference of a lens since the focal distance of the lens to the position of a variable power lens or movement magnitude does not become the same.
[0007]The zoom lens of a master side and another side is made into a slave side for one zoom lens, The zoom lens of a master side is driven by operation of a zoom switch, Also when the zoom lens of a slave side is considered as the composition which carries out a flattery drive based on the error of both zoom position, there is a problem that the grade of a focal distance error on either side changes with zoom positions a lot, with the non-linearity of the detector which detects a zoom position on either side.
[0008]It becomes a picture which is very hard to regard as a difference arising in photographing magnification on either side, fatigue is given to an observer, and there is a problem that prolonged use becomes difficult. This invention was made in view of such a situation, and an object of this invention is to provide the drive of the zoom lens which can coincide image magnification on either side with high precision, when changing the focal distance of the zoom lens of the video camera of two right and left.
[0009]
[Means for Solving the Problem]In a drive of a zoom lens which drives the 1st and 2nd zoom lenses arranged for photography of a stereoscopic picture at a right-and-left couple in order that this invention may attain said purpose, A zoom switch which orders it zooming of the tele direction or the wide direction, The 1st driving means that drives said 1st zoom lens in the tele direction or the wide direction by operation of said zoom switch, The 1st and the 2nd detection means of detecting a zoom position which shows photographing magnification of said 1st and 2nd zoom lenses, respectively, Based on zoom position data detected by the said 1st and 2nd detection means, The 2nd driving means that drives said 2nd zoom lens so that photographing magnification of said 2nd zoom lens may be in agreement with photographing magnification of said 1st zoom lens, The 1st and 2nd imaging means that picturize an object image which passed said 1st and 2nd zoom lenses, respectively, It is characterized by having an electronic zoom means which expands and contracts one image magnification electrically based on zoom position data detected by the said 1st and 2nd detection means so that it might be in agreement with image magnification of another side among pictures of a couple picturized by said 1st and 2nd imaging means.
[0010]According to this invention, about the 1st zoom lens, among zoom lenses of two right and left. Operation of a zoom switch performs zooming instructions in the tele direction or the wide direction, it drives so that photographing magnification on either side may be in agreement about the 2nd zoom lens based on zoom position data, and a motion of the 1st zoom lens is made to follow. Under the present circumstances, since it was made to carry out expanding-and-contracting adjustment of one image magnification electrically based on an output of a position transducer which detects a zoom position on either side so that it might be in agreement with image magnification of another side, an error of slight photographing magnification under flattery of said 2nd zoom lens is also cancelable on a picture. Thereby, image magnification on either side can be coincided with high precision also during a drive of the 1st and 2nd zoom lenses.
[0011]In a drive of a zoom lens which drives the 1st and 2nd zoom lenses arranged for photography of a stereoscopic picture at a right-and-left couple in order that this invention may attain said purpose, A zoom switch which orders it zooming of the tele direction or the wide direction, The 1st driving means that drives said 1st zoom lens in the tele direction or the wide direction by operation of said zoom switch, The 1st and the 2nd detection means of detecting a zoom position which shows photographing magnification of said 1st and 2nd zoom lenses, respectively, and digitizing and outputting this detected zoom position data, At least one zoom position data of the said 1st and 2nd detection means is inputted, At least one look-up table amended so that an output value according to a digital value of a this signal to input may be memorized beforehand and the zoom position detecting characteristic of the said 1st and 2nd detection means may be coincided, The 2nd driving means that drives said 2nd zoom lens so that it may be detected by the said 1st and 2nd detection means, and may be amended by said look-up table and photographing magnification of said 2nd zoom lens may be in agreement with photographing magnification of said 1st zoom lens based on zoom position data, The 1st and 2nd imaging means that picturize an object image which passed said 1st and 2nd zoom lenses, respectively, It is characterized by having an electronic zoom means which expands and contracts one image magnification electrically based on zoom position data

detected by the said 1st and 2nd detection means so that it might be in agreement with image magnification of another side among pictures of a couple picturized by said 1st and 2nd imaging means.
[0012]According to this invention, in consideration of variation of the output characteristics of a position transducer and nonlinearity which detect a zoom position on either side, at least one zoom position data is amended by a look-up table, and equalization of both output characteristics is attained. Since it was made to carry out expanding-and-contracting adjustment of one image magnification electrically based on said zoom position data so that it might be in agreement with image magnification of another side, an error of few magnifications under flattery of said 2nd zoom lens is also cancelable on a picture. Thereby, image magnification on either side can be coincided with high precision also during a drive of the 1st and 2nd zoom lenses.
[0013]
[Embodiment of the Invention]The desirable embodiment of the drive of the zoom lens applied to this invention according to an accompanying drawing below is described. The composition of the drive of 3D zoom lens which applied this invention is shown in drawing 1. The same numerals are given to the conventional zoom lens drive shown in drawing 9, and the identical or similar member among the figure. The drive of 3D zoom lens shown in drawing 1 controls the video cameras 1 and 2 on either side by the zoom switch 36 grade for carrying out the micro processing device 3, and a call / wide zooming command operation.
[0014]Said video cameras 1 and 2 comprise the composition of a right-and-left abbreviation EQC, and each camera comprises an another **** lens system, a lens control system, and an imaging system greatly. Although left-hand side and the video camera 2 are explained for the video camera 1 as right-hand side, exchange on either side is possible. The lens system of the left-hand side video camera 1 comprises the fixed lens 42, the variable power lens 12, and the focus lens 43, and photographing magnification is changed, and when said variable power lens 12 carries out back and forth movement, a focus is adjusted when said focus lens 43 carries out back and forth movement.
[0015]Said lens control system has a focus lens control system which carries out drive controlling of the zoom lens control system which carries out drive controlling of the variable power lens 12, and the focus lens 43. The motor 62 by which said zoom lens control system drives the variable power lens 12, Comprise the motor drive circuit (Motor Driver) 64 which operates this motor 62, and the 1st position transducer 16 that detects the position of said variable power lens 12, and said Motor Driver 64, It is controlled by the control signal from said MPU34, and the motor 62 is driven based on this control signal. Namely, when zooming instructions are carried out in the tele direction by the zoom switch 36, from MPU34. If the control signal of tele signal = high (H) wide signal = low (L) is outputted to said Motor Driver 64 and zooming instructions are carried out in the wide direction by the zoom switch 36, from MPU34, the control signal of tele signal =L and wide signal =H will be outputted to said Motor Driver 64. Release of the zooming instructions by the zoom switch 36 will output the control signal of tele signal =L and wide signal =L to said Motor Driver 64. And the variable power lens 12 drives forward and backward by this motor 62, and the photographing magnification of the zoom lens 10 is changed.
[0016]Said 1st position transducer 16 comprises a potentiometer, for example, and detects the position of the variable power lens 12 between tele terminal-wide ends as the zoom position voltage Va. This zoom position voltage Va is used as information which shows the photographing magnification of the left-hand side zoom lens 10. After said zoom position voltage Va is digitized by AD converter 17 in 0-255, it is applied to the look-up table (LUT) 18. LUT18 is the input-output-conversion table which memorized beforehand the output value according to the digital value of the signal to input, and has a conversion function which coincides the output characteristics of the 1st position transducer 16 with the standard zoom function used as a standard. The zoom position data amended by said LUT18 is notified to MPU34 while it is added to the comparator 30 and the subtractor 32 which are mentioned later. Said LUT18 is mentioned further later.
[0017]By the way, the motor 66 by which said focus lens control system drives the focus lens 43 to a cross direction, The motor drive circuit (Motor Driver) 67 which operates this motor 66, and the sensor which detects the position of said focus lens are comprised, While said Motor Driver 67 is controlled based on the auto-focusing (AF) means which is not illustrated and carrying out the focus drive of the focus lens 43, the focus lens 43 is driven so that a focusing state may be acquired according to the position of said variable power lens 12. And said sensor 68 detects the position of the focus lens 43, and

notifies to MPU34 as focal position data.
[0018]Next, the imaging system of the video camera 1 is explained. This imaging system comprises CCD45, CCD drive circuit (driver) 46, CDS circuit 47, the reference signal generator (speed signal generator) 49, the auto gain controller (AGC) 82, AD converter 83, the electronic zoom circuit 84, and DA converter 85 grade.
[0019]Image formation of the object light which passed the lens system mentioned above is carried out to the acceptance surface of CCD45, and it is changed into R of quantity according to the intensity of light, G, and B signal charge. After the electric charge of R, G, and B is read by the read pulse added from CCD drive circuit 46 and signal separation is carried out by CDS circuit 47, a gain is adjusted by AGC82 and it is digitized by AD converter 83. Image magnification is adjusted in the electronic zoom circuit 84, and the digitized picture signal is outputted as a video signal through DA converter 85, after publicly known signal processing which is not illustrated is performed. The timing signal from speed signal generator49 is added to said CCD drive circuit 46 and CDS circuit 47, respectively, and the synchronization of each circuit is taken.
[0020]Said electronic zoom circuit 84 carries out scaling of the screen electronically including an arithmetic processing section, an image memory, etc. by the address control of read-out in the image memory which memorizes the digital image signal for one screen, and the read interpolating calculation of a digital image signal. In this embodiment, the magnification of the electronic zoom of a left-hand side camera is set, for example as an about 1.1-time fixed value.
[0021]On the other hand, about the right-hand side video camera 2 a lens system, Comprise the fixed lens 52, the variable power lens 22, and the focus lens 53, and said lens control system, It is the point of having a focus lens control system which carries out drive controlling of the zoom lens control system which carries out drive controlling of the variable power lens 22, and the focus lens 53, and is the same as that of the video camera 1 of the left-hand side mentioned above.
[0022]Although the zoom lens control system of this right-hand side is the same as that of the motor 72 which drives the variable power lens 22, the motor drive circuit (Motor Driver) 74 which operates this motor 72, and the 1st actuator mentioned above at the point which comprises the 2nd position transducer 26 that detects the position of said variable power lens 22, The control methods differ. Namely, said Motor Driver 74 is that by which drive controlling is carried out based on the error of the zoom position of the right and left detected by the comparator 30, The variable power lens 22 is driven so that the error of the zoom position produced by motion of the zoom lens of the left-hand side preceded and driven by operation of the zoom switch 36 may be made small. In other words, the error of photographing magnification on either side is made into the minimum by making the zoom lens of a master side and right-hand side into a slave side for a left-hand side zoom lens, and making the variable power lens 22 of a slave side follow a motion of the variable power lens 12 of a master side. This control is mentioned further later.
[0023]Said 2nd position transducer 26 detects the position of the variable power lens 22, and outputs it as the zoom position voltage Vb. After being digitized by AD converter 27 in 0-255, this zoom position voltage Vb is applied to LUT28, and is amended. LUT28 is the input-output-conversion table which memorized beforehand the output value according to the digital value of the signal to input, and has a conversion function which coincides the output characteristics of the 2nd position transducer 26 with the standard zoom function used as a standard. Step is kept with the standard zoom function in which the output characteristics of the 1st position transducer 16 of the left-hand side mentioned above are common by this.
[0024]The zoom position data amended by said LUT28 is notified to MPU34 while it is added to the comparator 30 and the subtractor 32. By the way, a right-hand side focus lens control system, The motor 76 which drives the focus lens 53 to a cross direction, and the motor drive circuit (Motor Driver) 77 which operates this motor 76 are comprised, While said Motor Driver 77 is controlled based on the auto-focusing (AF) means which is not illustrated and carrying out the focus drive of the focus lens 53, the focus lens 53 is driven so that a focusing state may be acquired according to the position of said variable power lens 22. And said sensor 78 detected the position of the focus lens 53, and has notified to MPU34 as focal position data.
[0025]Next, the imaging system of a right-hand side camera is explained. This imaging system comprises CCD55, CCD drive circuit (driver) 56, CDS circuit 57, the reference signal generator (speed signal

generator) 59, the auto gain controller (AGC) 92, AD converter 93, the electronic zoom circuit 94, and DA converter 95 grade like the left-hand side mentioned above.
[0026]Differing from left-hand side composition is a point which controls the electronic zoom circuit 94 according to the output of said subtractor 32, and amends electron zoom magnification. That is, he is trying to tune right-hand side image magnification finely based on the difference of photographing magnification on either side on the basis of left-hand side image magnification. The magnification adjustment of this electronic zoom is mentioned later. Next, the drive controlling of a right-hand side zoom lens is explained.
[0027]The output characteristics of said 1st and 2nd position transducers are qualitatively shown in drawing 2. As shown in the figure, the zoom position [position transducers / said / 16 and 26 / 1st and 2nd] voltage according to the position of the variable power lenses 12 and 22 is outputted. When the variable power lenses 12 and 22 are in a wide side, zoom position voltage is large, and when the variable power lenses 12 and 22 are in the call side, signs that zoom position voltage becomes small are shown.
[0028]Drawing 3 is a graph which shows how to amend the output characteristics of said position transducer using LUT. Graph ** of the curve shown in the right-hand side of the figure shows the zoom position voltage by which a direct output is carried out from the 1st position transducer 16 (or the 2nd position transducer 26). As shown in the figure, the output of zoom position voltage has nonlinear characteristics to the zoom position between wide end-tele terminals. It amends by LUT18 (or LUT28) so that such a nonlinear detecting characteristic may be coincided with linear characteristic-function (standard zoom function) **.
[0029]That is, the analog zoom position voltage outputted from the 1st position transducer 16 and 26 is first digitized by AD converters 17 and 27, respectively, and let it be a zoom voltage AD value. Subsequently, the input/output relation of LUTs 18 and 28 is set that output data is in said standard zoom function, using this zoom voltage AD value as input data of LUTs 18 and 28, and it memorizes beforehand (refer to graph [on the left-hand side of a figure] **). This will have linearity with the common position transducers 16 and 26 on either side to change of the zoom position of the variable power lenses 12 and 22.
[0030]Drawing 4 is a key map of LUT and signs that it matches with the output data of the figure upper part are shown to the input digital value on the right-hand side of a figure. This LUT comprises a rewritable storage cell individually, and it is possible by changing setting out correspondence-related [this] to change suitably the output characteristics of the position transducer mentioned above. Drawing 5 is a block diagram showing the important section of the control system of Motor Driver 74 which drives the zoom lens 20 of the right-hand side shown in drawing 1. The zoom position data amended by LUTs 18 and 28 shown in drawing 1 is inputted into the comparator 30, respectively, and the error of a zoom position on either side is detected by this comparator 30. If the zoom position data of A and a slave side (right-hand side) is set to B for the zoom position data of a master side (left-hand side), for example at this time, in A>B, the high (H) signal and the low (L) signal will be outputted from the comparator 30, and it will be added to INA of Motor Driver 74, and INB, respectively.
[0031]In A=B, the low (L) signal and the low (L) signal are outputted from the comparator 30, and it is added to INA of Motor Driver 74, and INB, and, respectively in A<B, The low (L) signal and the high (H) signal are outputted from the comparator 30, and it is added to INA of Motor Driver 74, and INB, respectively. Drawing 6 is a truth value table of Motor Driver 74, and the correspondence relation of the output signal outputted from this Motor Driver 74 is shown to the combination of the input signal applied to the input terminal INAINB.
[0032]When both the input signals applied to the input terminal (INA, INB) are lows (L, L), from the output terminal (OUTA, OUTB) of Motor Driver 74, it is outputted, respectively (L, L). In this case, the motor 72 stops. When the input signal applied to the input terminal (INA, INB) is each (L, H), from the output terminal (OUTA, OUTB) of Motor Driver 74, it is outputted, respectively (L, H). In this case, the motor 72 is driven to the call side.
[0033]When the input signal applied to the input terminal (INA, INB) is each (H, L), from the output terminal (OUTA, OUTB) of Motor Driver 74, it is outputted, respectively (H, L). In this case, the motor 72 is driven to a wide side. When the input signal applied to the input terminal (INA, INB) is each (H, H), from the output terminal (OUTA, OUTB) of Motor Driver 74, it is outputted, respectively (H, H). In this case, brakes are applied to the motor 72. The same may be said of Motor Driver 64. However, in order to

make small a zoom position error on either side, it is necessary to set up right-hand side driving speed greatly compared with left-hand side driving speed.
[0034]Next, the magnification correction of a right-hand side electronic zoom circuit is explained. Drawing 7 is an important section block diagram showing the concrete composition of the electronic zoom circuit 94. The electronic zoom circuit 84 mainly comprises the buffering write 102, the frame memory 104, the read buffer 106, the write address generation circuit 108, the read address generation circuit 110, and timing signal generating circuit (speed signal generator) 112 grade.
[0035]The picture signal digitized by AD converter 93 shown in drawing 1 is inputted into the buffering write 102 one by one via the digital signal processor (DSP:digital signal processor) which is not illustrated. An address is specified by the write address generation circuit 108, and the picture signal temporarily memorized by the buffering write 102 is written in the frame memory 104 based on the writing timing signal from speed signal generator112. The image data written in the frame memory 104 is read according to the reading address specified by the read address generation circuit 110, and is outputted to DA converter 95 via the read buffer 106. Timing is adjusted by speed signal generator112 so that the above-mentioned writing operation and read operation may be repeated by turns. When adding a reading address to a frame memory, an enlarged picture or a reduced screen is obtained by adjusting a read-out start address, the timing of read-out, etc. A required operation is performed in some numbers by arithmetic processing section or MPU34 which is not illustrated.
[0036]The feature of this embodiment controls said read address generation circuit 110 based on the output from the subtractor 32 shown in drawing 1, and is that it tunes the magnification of a right-hand side screen finely. The subtractor 32 outputs the signal according to both difference based on the zoom position data of the left-hand side amended by LUT18, and the zoom position data of the right-hand side amended by LUT28. Since the output characteristics of the zoom position detectors 16 and 26 are arranged by LUTs 18 and 28 as shown in drawing 3, and a focal distance error is not changed with a zoom position, adjustment of image magnification is possible by the difference of a zoom position.
[0037]When the photographing magnification of the right-hand side zoom lens 20 is smaller than the photographing magnification of the left-hand side zoom lens 10, According to the photographing magnification difference (zoom position difference), a screen is expanded by the electronic zoom circuit 94, when the photographing magnification of the right-hand side zoom lens 20 is larger than the photographing magnification of the left-hand side zoom lens 10, by the electronic zoom circuit 94, a screen is reduced and image magnification on either side is made equal. Since left-hand side electron zoom magnification is somewhat large with 1.1 times also when reducing a right-hand side screen by electronic zoom when right-hand side photographing magnification is larger than left-hand side, when reducing a right-hand side screen by electronic zoom, picture information does not run short.
[0038]According to the drive of the zoom lens constituted like the above, if zooming instructions are made in the tele direction or the wide direction by operation of the zoom switch 36, based on these instructions, the left-hand side (master side) zoom lens 10 will drive. On the other hand, the right-hand side (slave side) zoom lens 20 is driven based on the error of a zoom position on either side, and follows the zoom lens 10 of a master side. Under the present circumstances, by having amended the output characteristics of the position transducers 16 and 26 which detect a zoom position on either side by LUTs 18 and 28, respectively so that it might be in agreement with a common standard zoom function with both linearity, Change of the error of the focal distance depending on a zoom position is controlled, and the error of the photographing magnification of the right and left by the individual difference of the zoom lenses 10 and 20 is reduced.
[0039]And since it was made to make the variable power lens 22 of a slave side follow the variable power lens 12 of a master side based on the output of these position transducers 16 and 26, a focal distance on either side can be coincided with high precision. Since the magnification of the electronic zoom of a slave side is controlled and it was made to coincide the image magnification of a slave side with the image magnification of a master side based on the zoom position data amended by LUTs 18 and 28, The error of the slight photographing magnification under flattery drive of the variable power lens 22 of a slave side is also cancelable on a picture. Thereby, image magnification on either side can be coincided with high precision also during the zooming drive of a zoom lens.
[0040]Although two LUTs were provided and the case where the output characteristics of two position transducers were changed into a common standard zoom function was explained by the above-mentioned

embodiment, the mode which constitutes LUT from one is also possible. That is, only the zoom position detecting characteristic of another side is amended by LUT, and it may be made to arrange it with the standard side on the basis of one zoom position detecting characteristic in the zoom lens drive shown in drawing 1.

[0041]Drawing 7 is a graph which shows how to double [to amend the output characteristics of the 2nd position transducer 26 (slave side), when the number of LUTs is one, and] with the output characteristics of the 1st position transducer 16 (master side). Graph ** of the curve which graph ** of the curve shown in the upper right side of a figure showed the zoom data by which a direct output is carried out from the position transducer of a master side, and was shown in the lower right side of a figure shows the zoom data by which a direct output is carried out from the position transducer of a slave side.

[0042]The analog zoom position voltage outputted from the position transducer 26 of a slave side is digitized by AD converter 27, and let it be a zoom voltage AD value. Subsequently, the input/output relation of LUT28 is set that output data is in agreement with the zoom data of said master side, using this zoom voltage AD value as input data of LUT, and it memorizes beforehand (refer to graph [on the left-hand side of a figure] **). Thereby, a position transducer on either side will have common output characteristics to change of the zoom position of each variable power lens 12 and 22, and the error of the photographing magnification resulting from the individual difference of a zoom lens on either side can be reduced.

[0043]Although the above-mentioned embodiment explained the case where the output characteristics of the zoom position detectors 16 and 26 were made to communalize using LUT, not using LUT is also considered when it is what is a grade which the output characteristics of a zoom position detector fully have linearity, and can disregard individual difference.

[0044]

[Effect of the Invention]According to the drive of the zoom lens applied to this invention as explained above, about the 1st zoom lens, among the zoom lenses of two right and left. Drive in the tele direction or the wide direction by operation of a zoom switch, and about the 2nd zoom lens. It drives so that photographing magnification on either side may be in agreement based on the zoom position data in which the photographing magnification of a zoom lens on either side is shown, Since it was made to carry out expanding-and-contracting adjustment of one image magnification electrically based on zoom position data on either side so that it might be in agreement with the image magnification of another side, While being able to drive so that the photographing magnification of a zoom lens on either side may be coincided with high precision, the error of the slight photographing magnification under flattery of said 2nd zoom lens is also cancelable on a picture.

[0045]Since at least one zoom position data of the position transducers which detect a zoom position on either side is amended by a look-up table and equalization of both output characteristics was attained, Change of the error of the focal distance depending on a zoom position can be controlled, and the error of the photographing magnification of the right and left by the individual difference of a zoom lens can be reduced. And since it was made to carry out expanding-and-contracting adjustment of one image magnification electrically based on the zoom position data amended by the look-up table so that it might be in agreement with the image magnification of another side, image magnification on either side can be coincided still with high precision, and photography of a good stereoscopic picture is attained.